Extreme Climate in Texas

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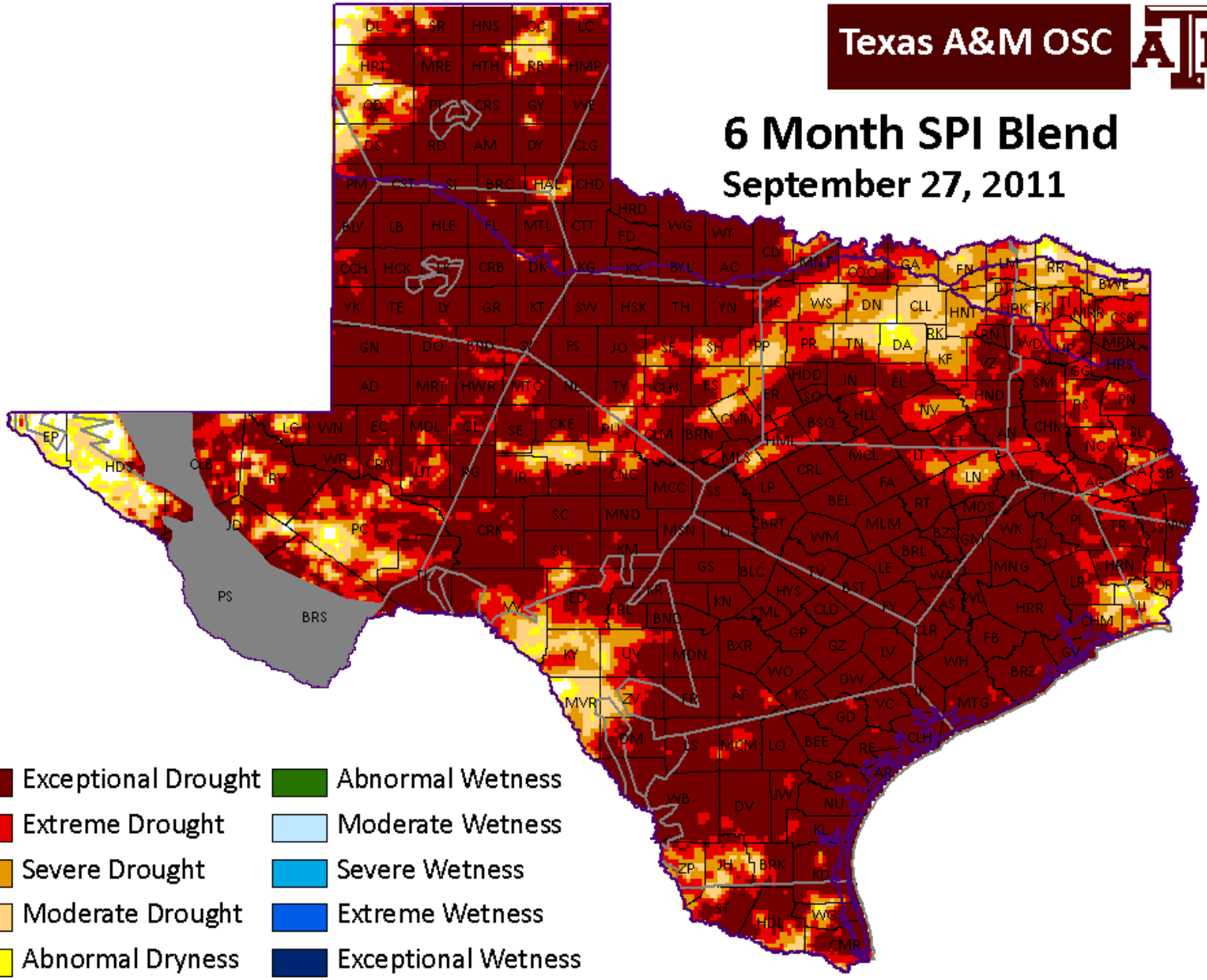
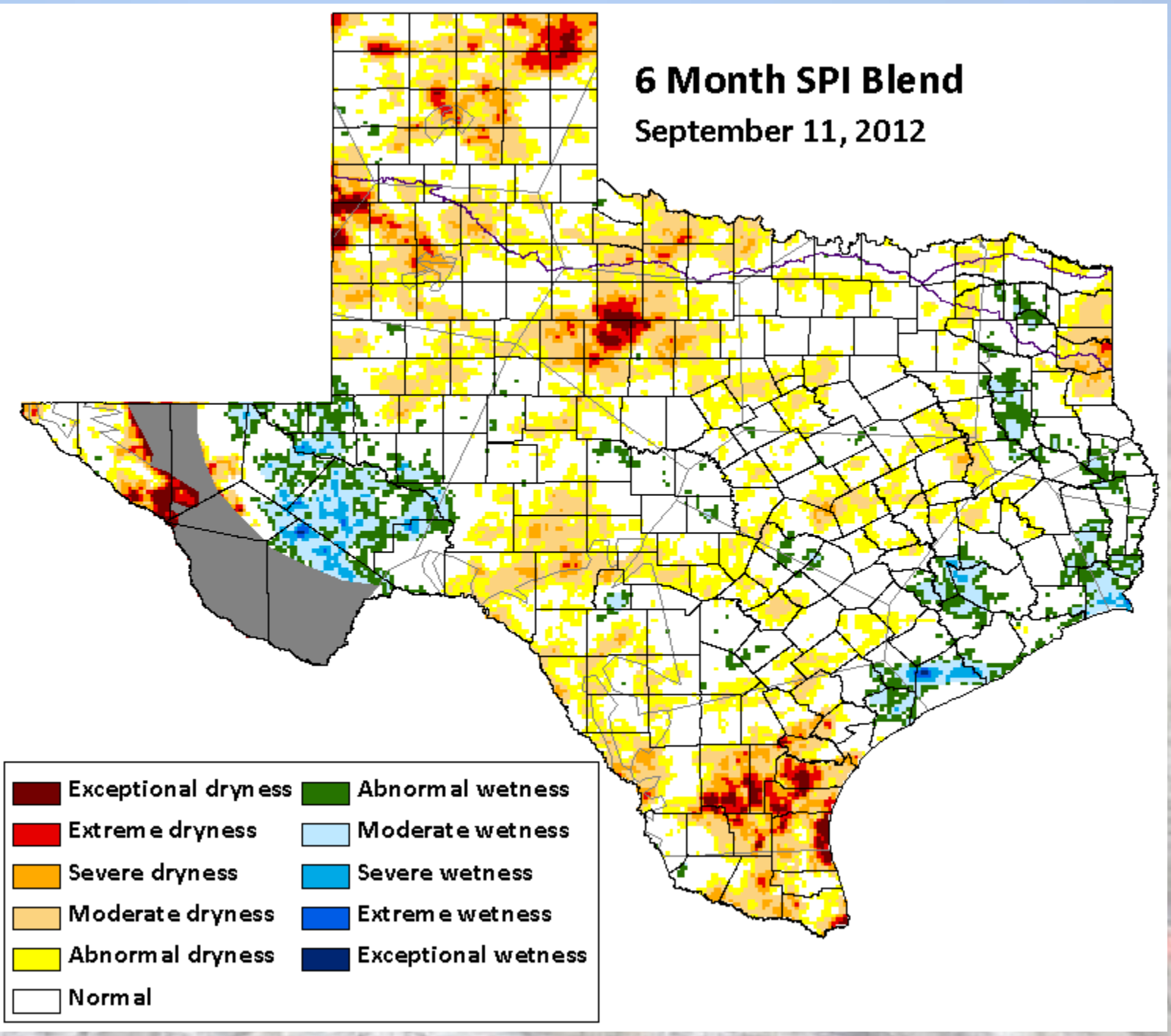
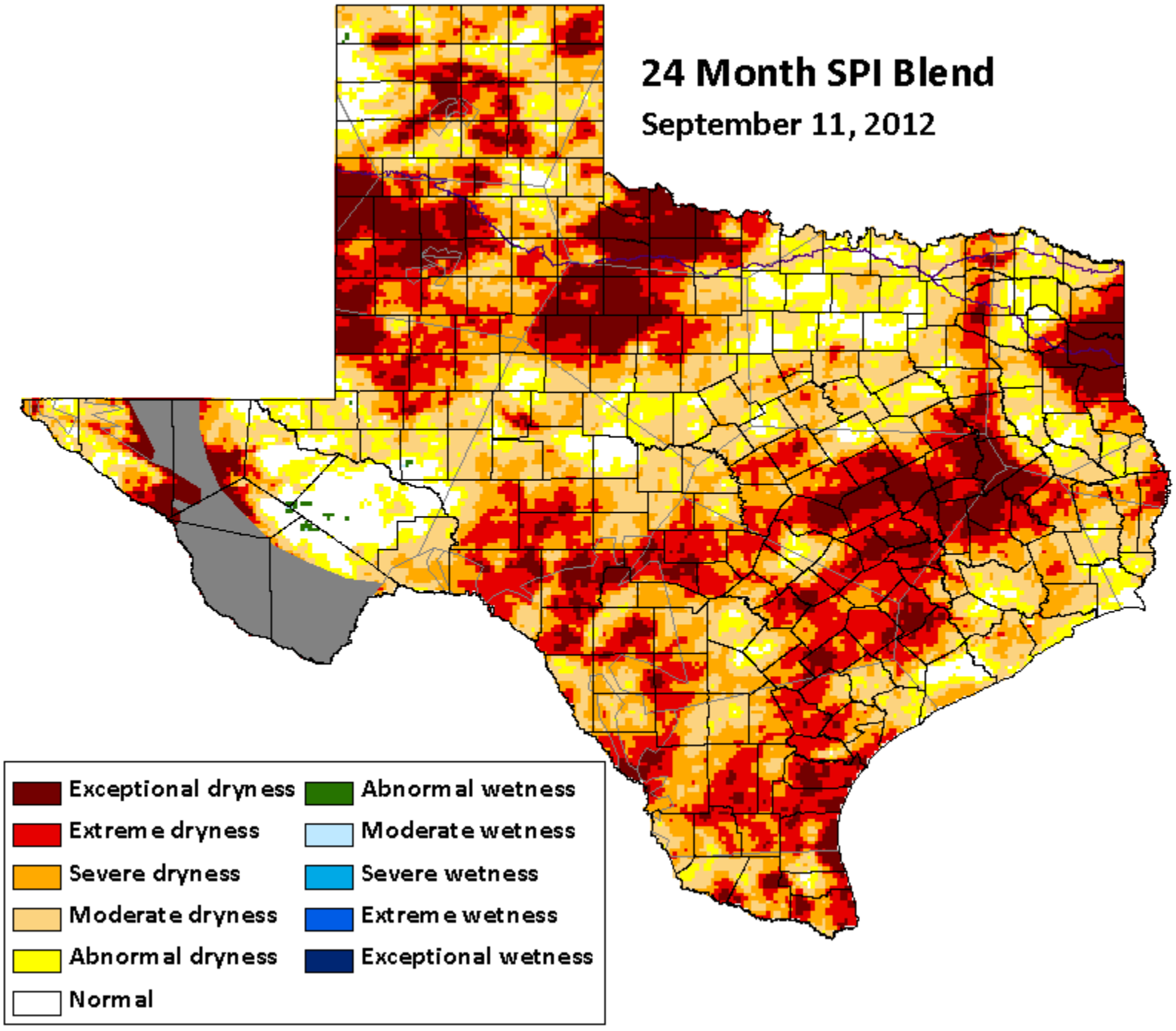
Texas A&M OSC

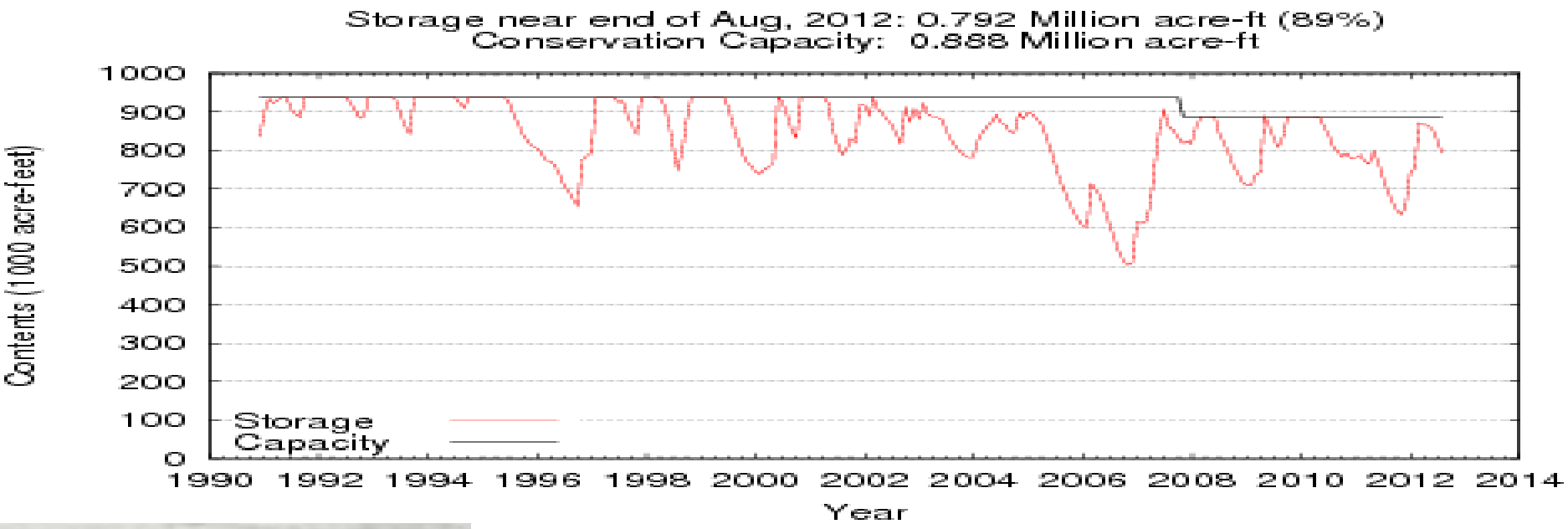
6 Month SPI Blend

September 27, 2011

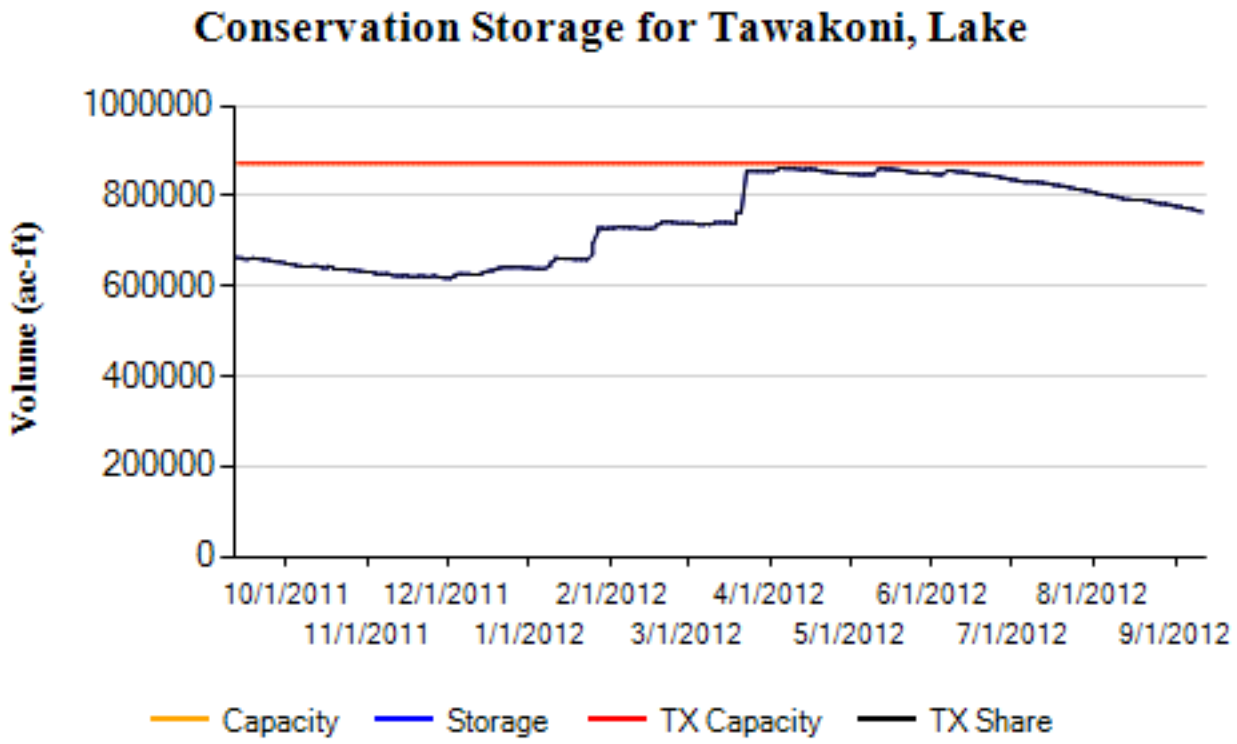


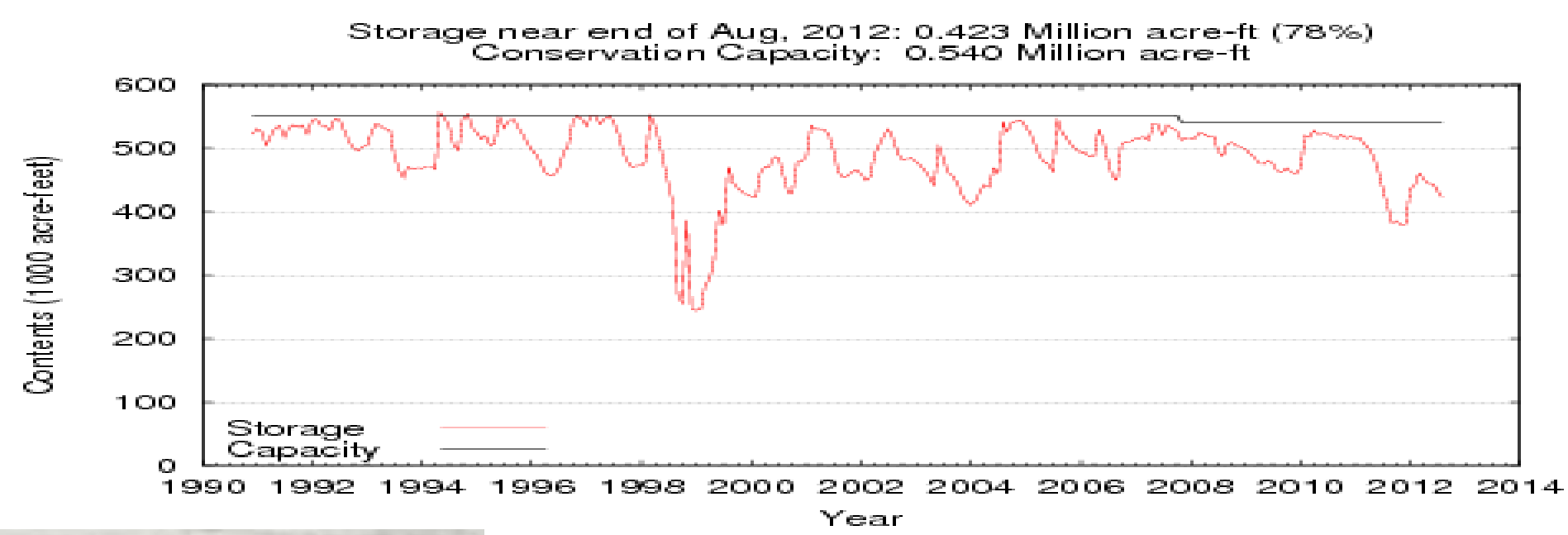

6 Month SPI Blend
September 11, 2012
Exceptional dryness
Extreme dryness
Severe dryness
Moderate dryness
Abnormal dryness
Normal
Abnormal wetness
Moderate wetness
Severe wetness
Extreme wetness
Exceptional wetness


24 Month SPI Blend
September 11, 2012
Exceptional dryness
Extreme dryness
Severe dryness
Moderate dryness
Abnormal dryness
Normal
Abnormal wetness
Moderate wetness
Severe wetness
Extreme wetness
Exceptional wetness

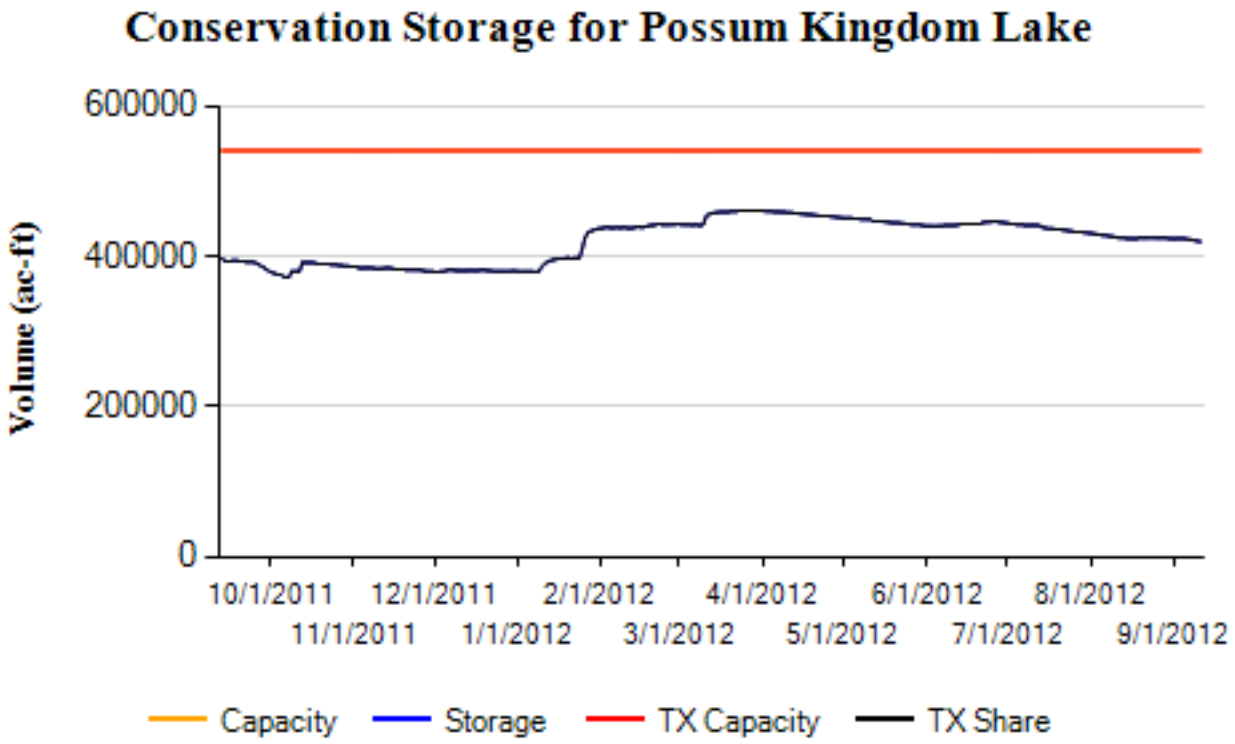


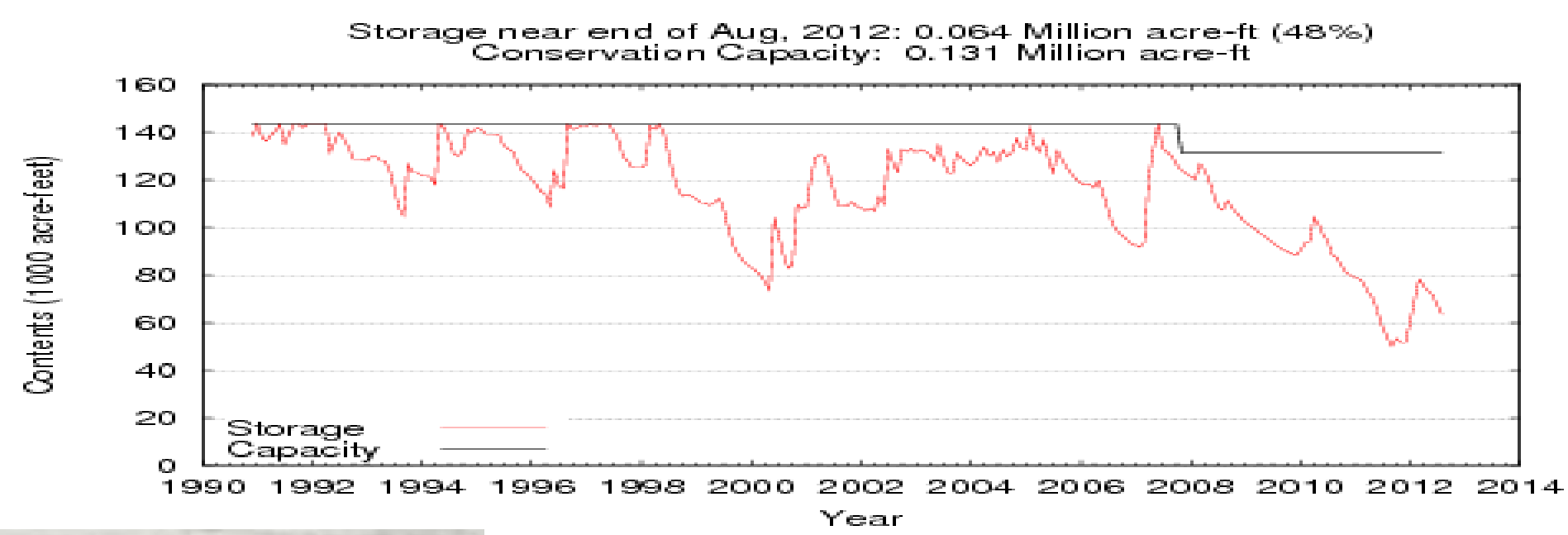
Quick Recovery



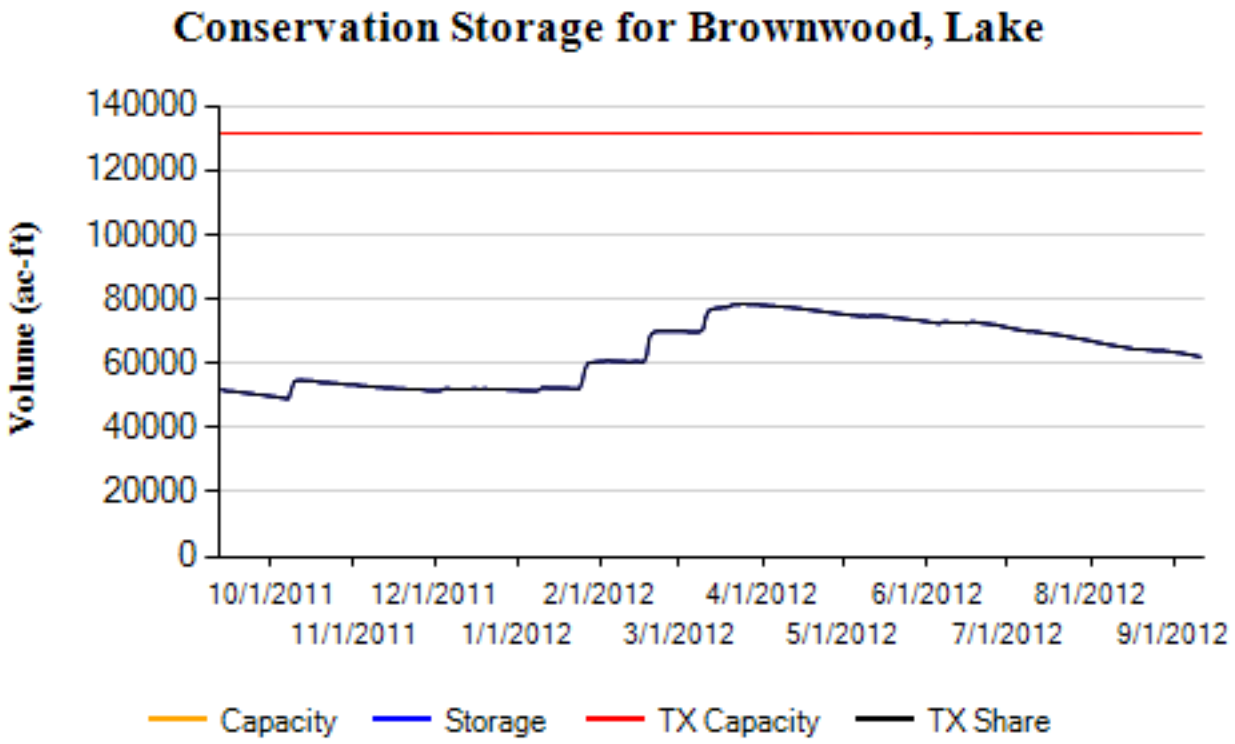


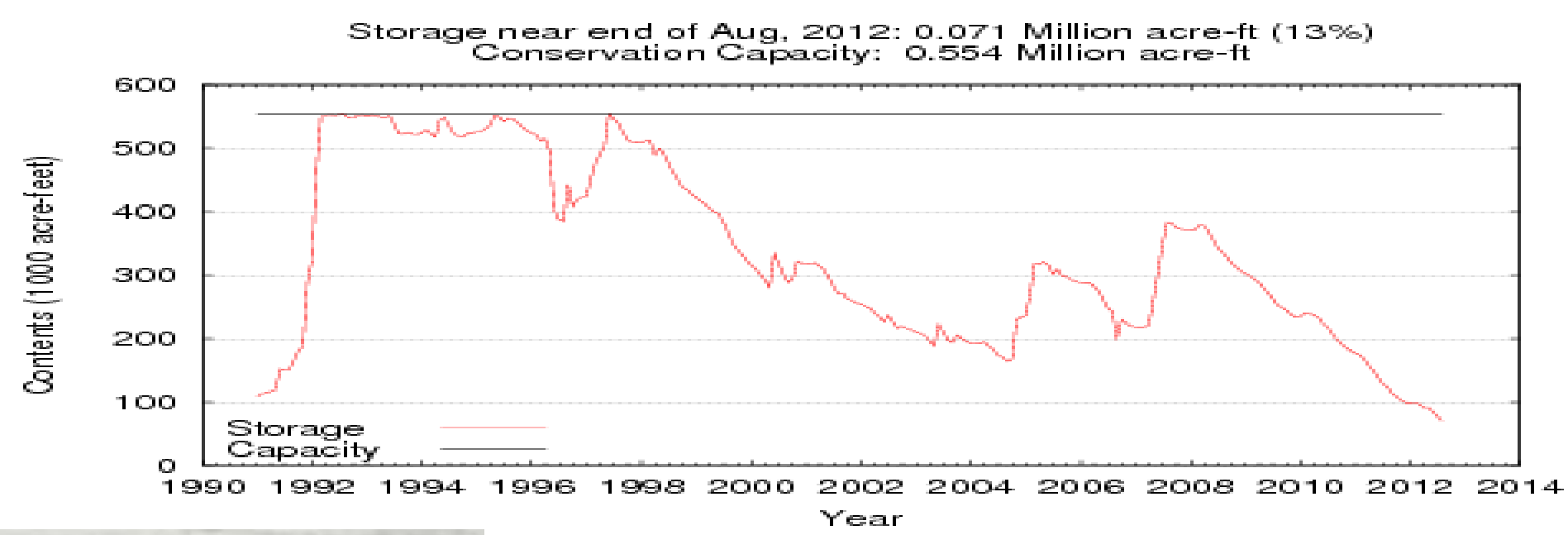
Second Drought Year



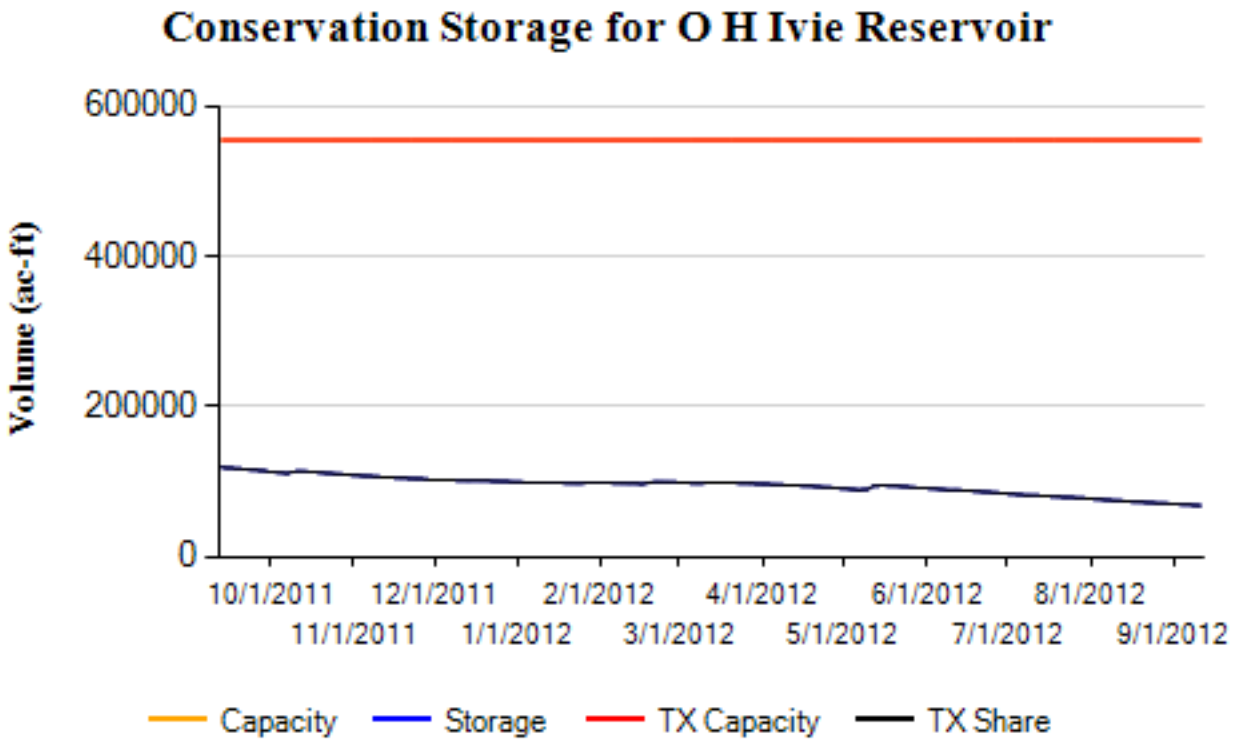


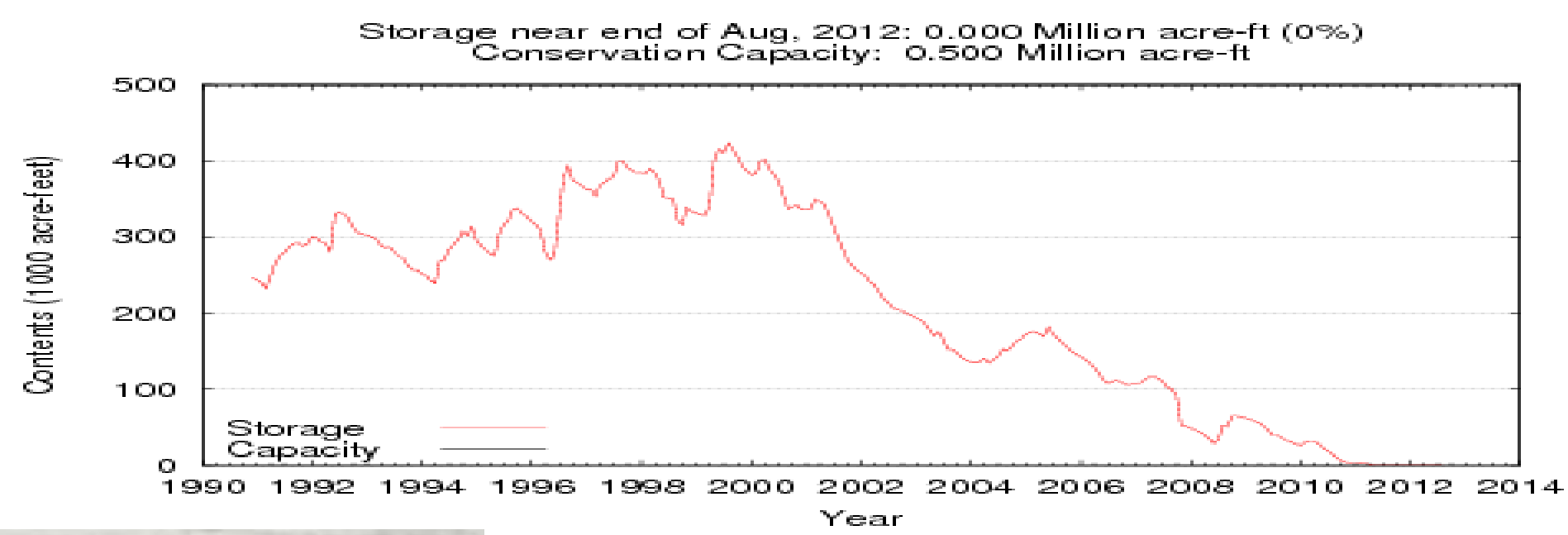
Multi-Year Drought

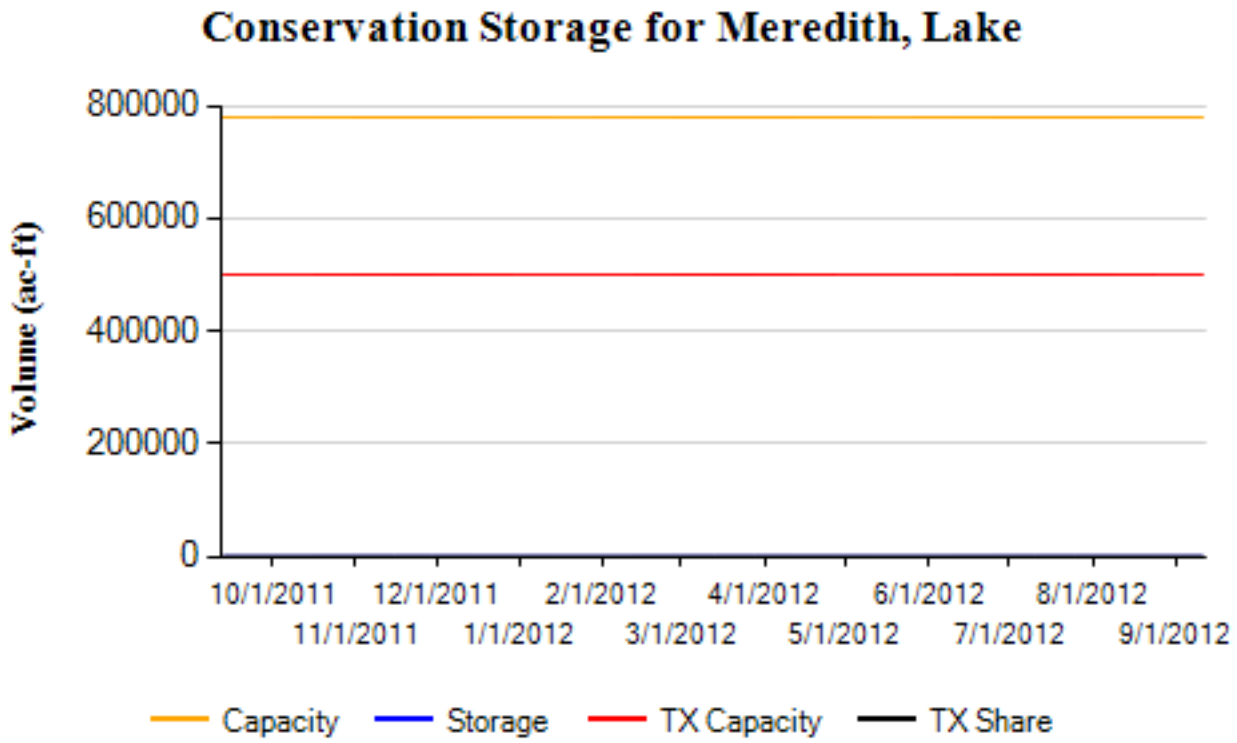


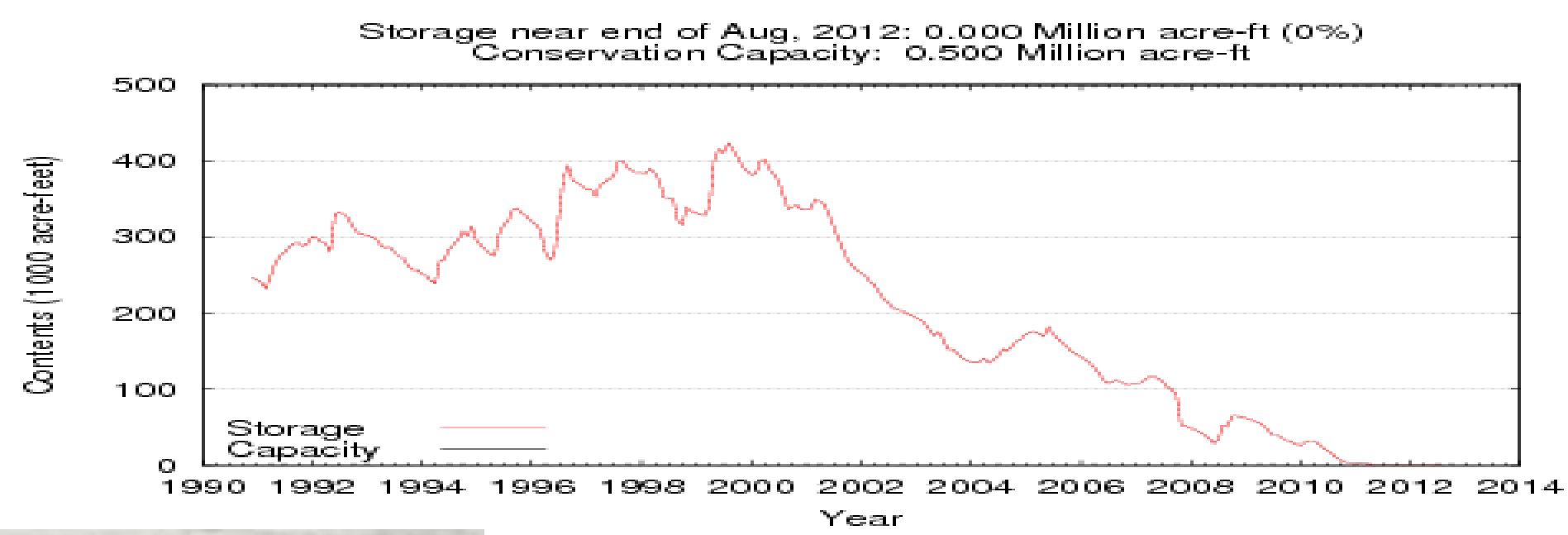


Systemic Drought

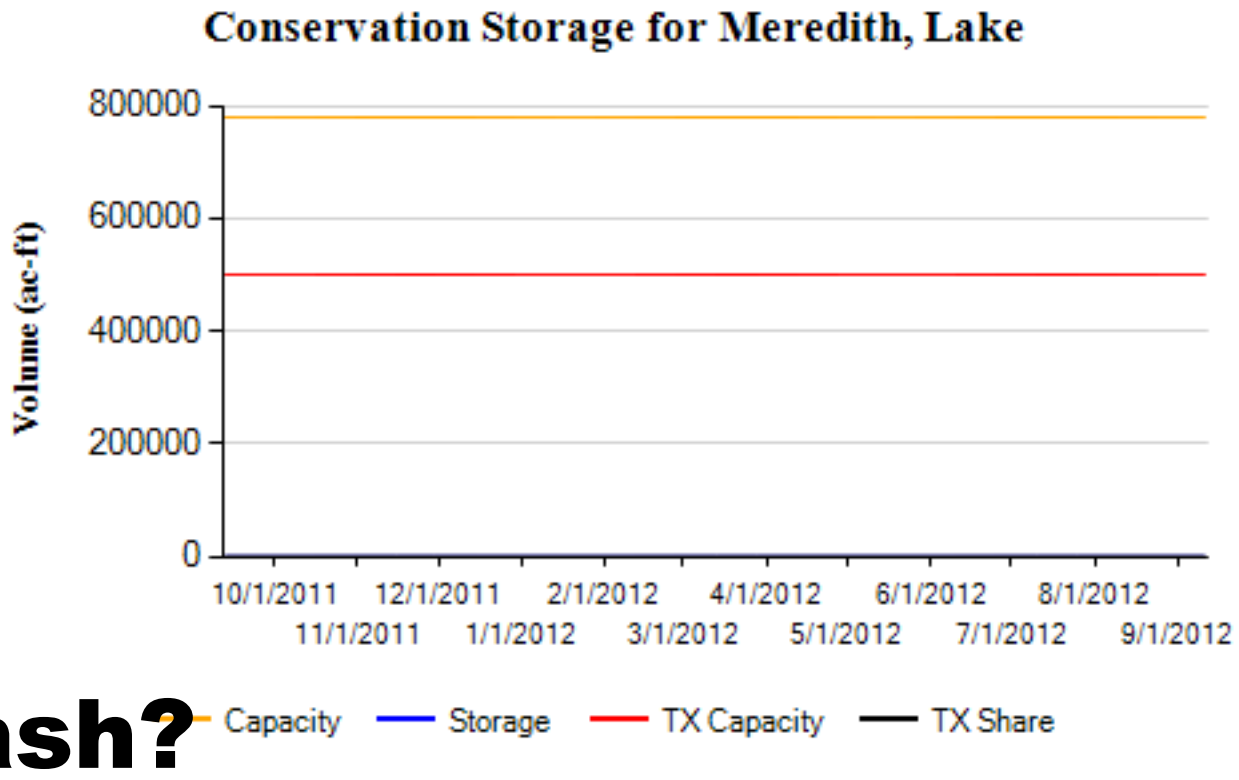


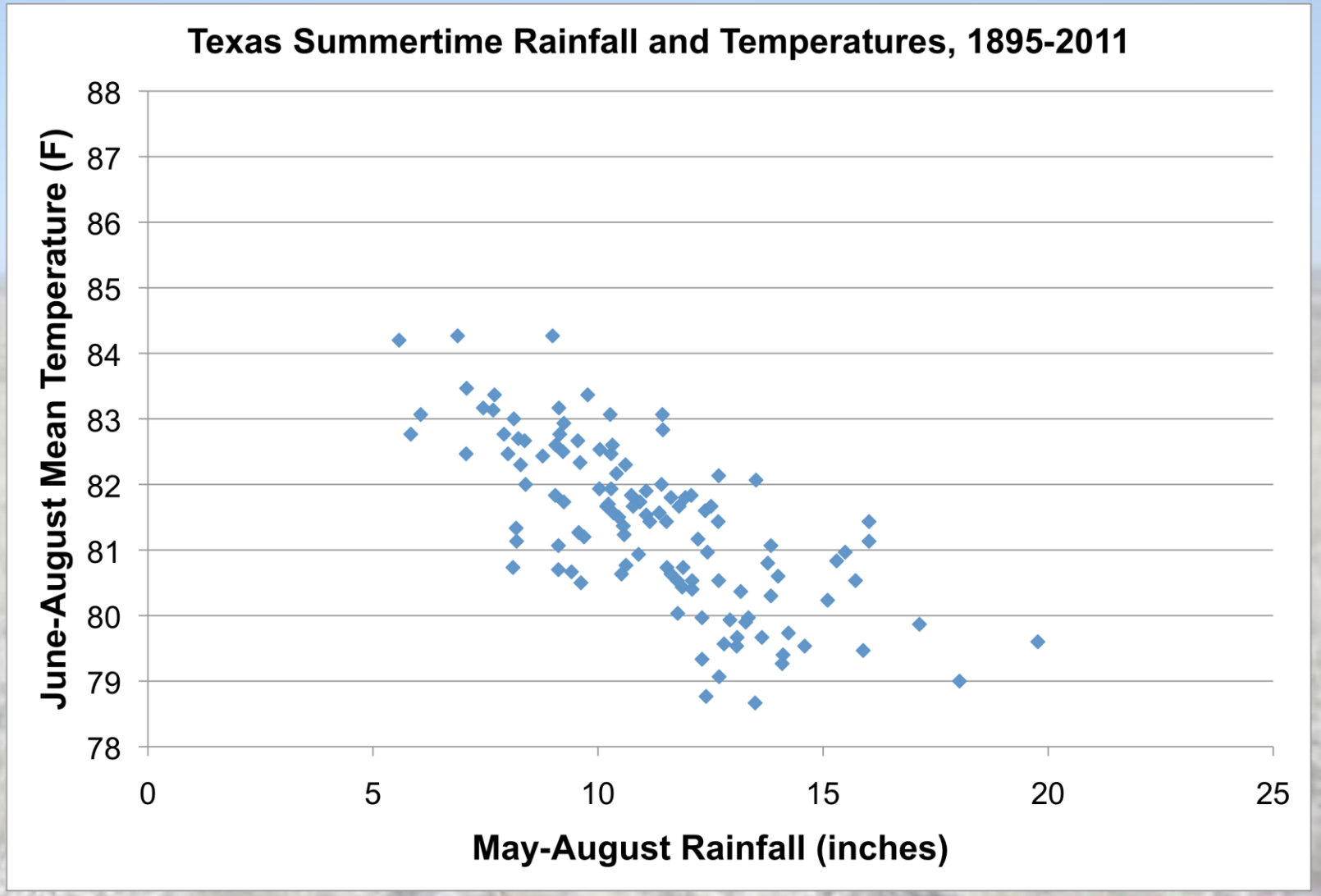

Storage near end of Aug, 2012: 0.000 Million acre-ft (0%)
Conservation Capacity: 0.500 Million acre-ft
Contents (1000 acre-feet)
500
400
300
200
100
0
Storage
Capacity
1990 1992 1994 1996 1998 2000 2002 2004 2006 2008 2010 2012 2014
Year

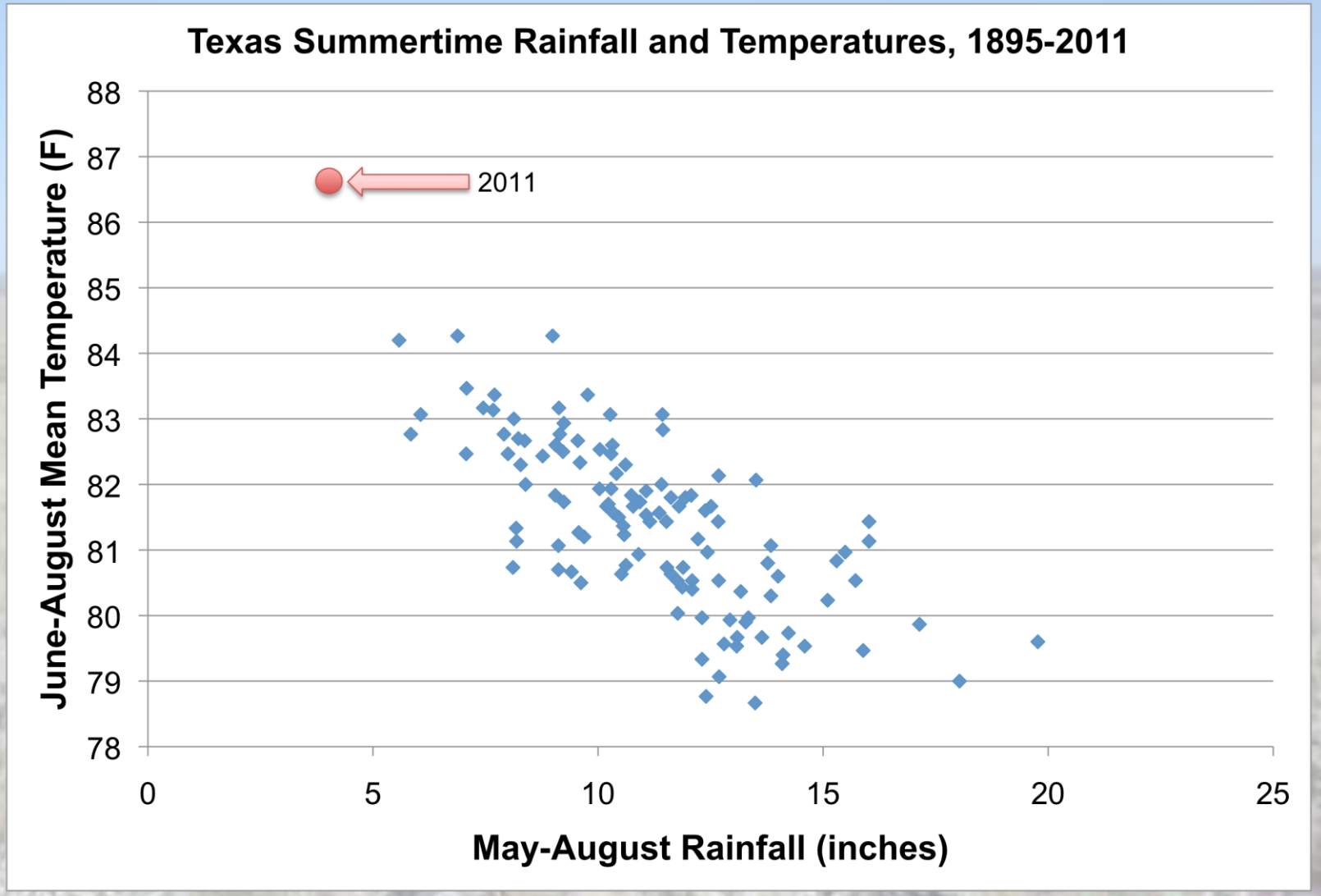

Conservation Storage for Meredith, Lake
Volume (ac-ft)
800000
600000
400000
200000
0
10/1/2011
11/1/2011
12/1/2011
1/1/2012
2/1/2012
3/1/2012
4/1/2012
5/1/2012
6/1/2012
7/1/2012
8/1/2012
9/1/2012
Capacity
Storage
TX Capacity
TX Share



What if a raindrop falls in a reservoir and it doesn't make a splash?




Texas Summertime Rainfall and Temperatures, 1895-2011
June-August Mean Temperature (F)
88
87
86
85
84
83
82
81
80
79
78
0
5
10
15
20
25
May-August Rainfall (inches)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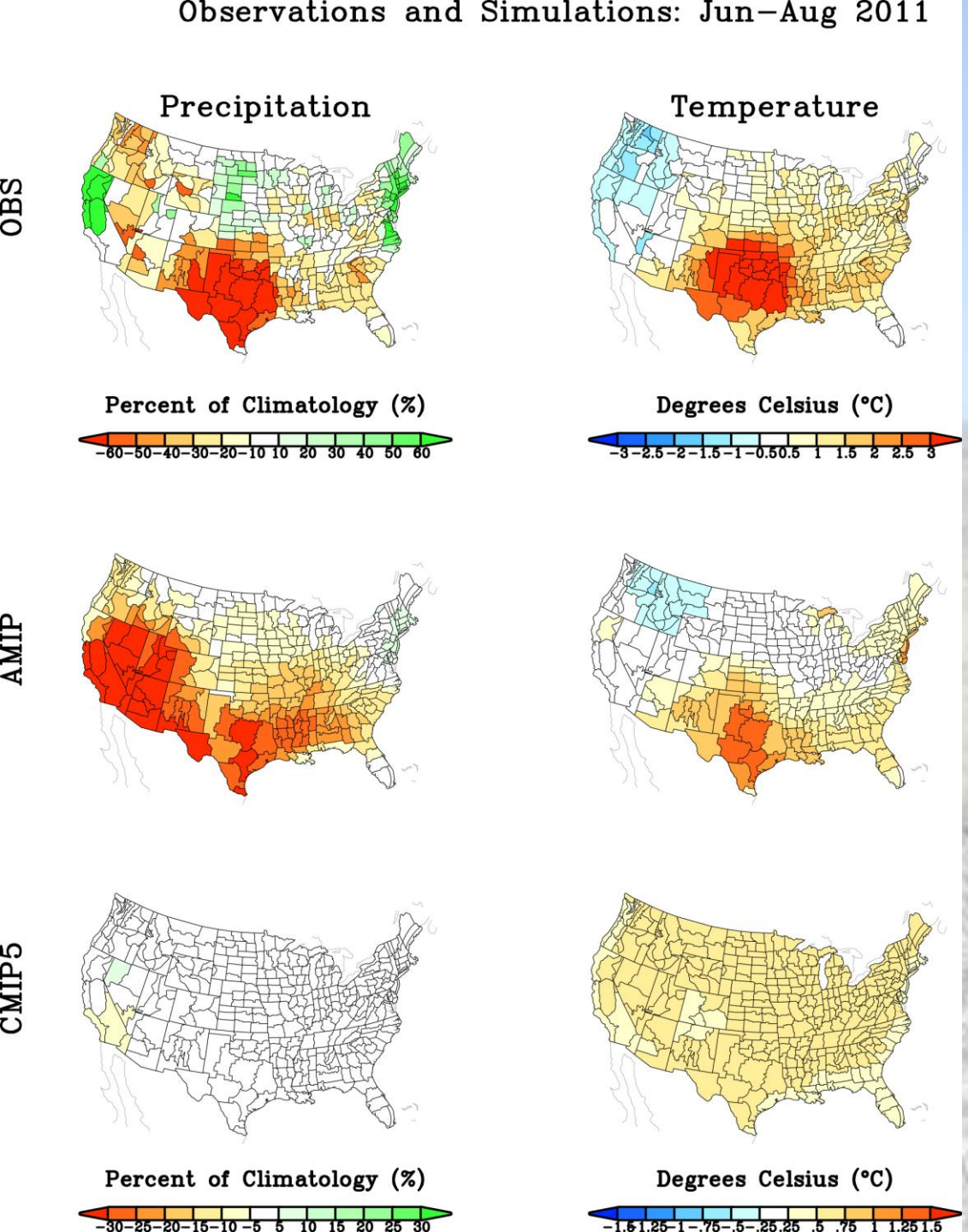
79
78
2011
0
5
10
15
20
25
May-August Rainfall (inches)

Why the 2011 Heat Wave/Drought? New Science

- Teamed up with NOAA's Earth System Research Laboratory and Climate Prediction Center
- Broke down the 2011 heat wave into its root causes
- Paper in peer review



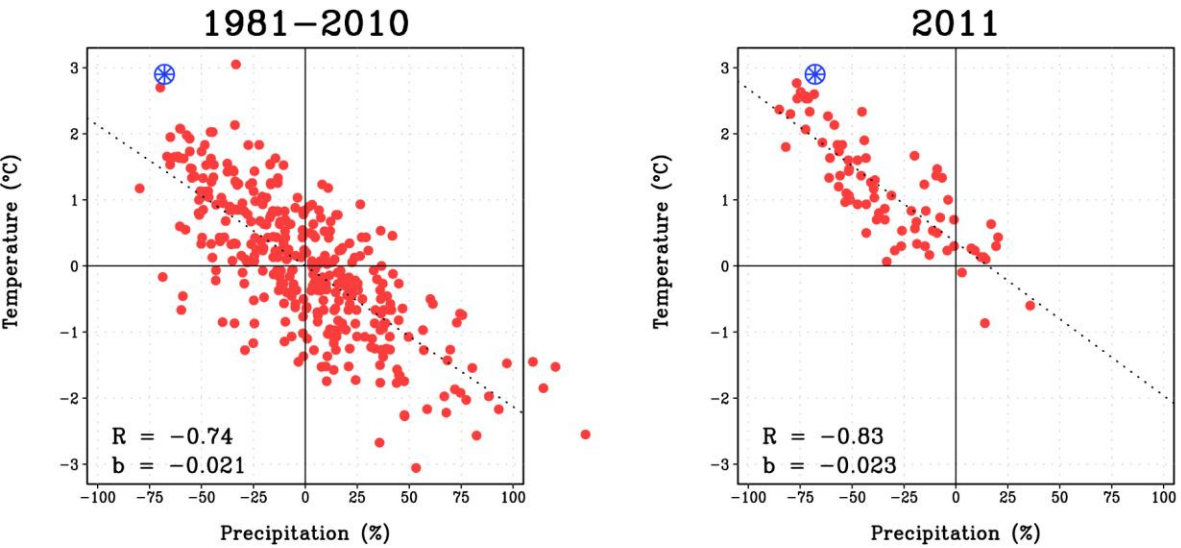
What really happened

Atmosphere-only model, observed sea surface temperatures

Atmosphere-Ocean model, observed climate forcings

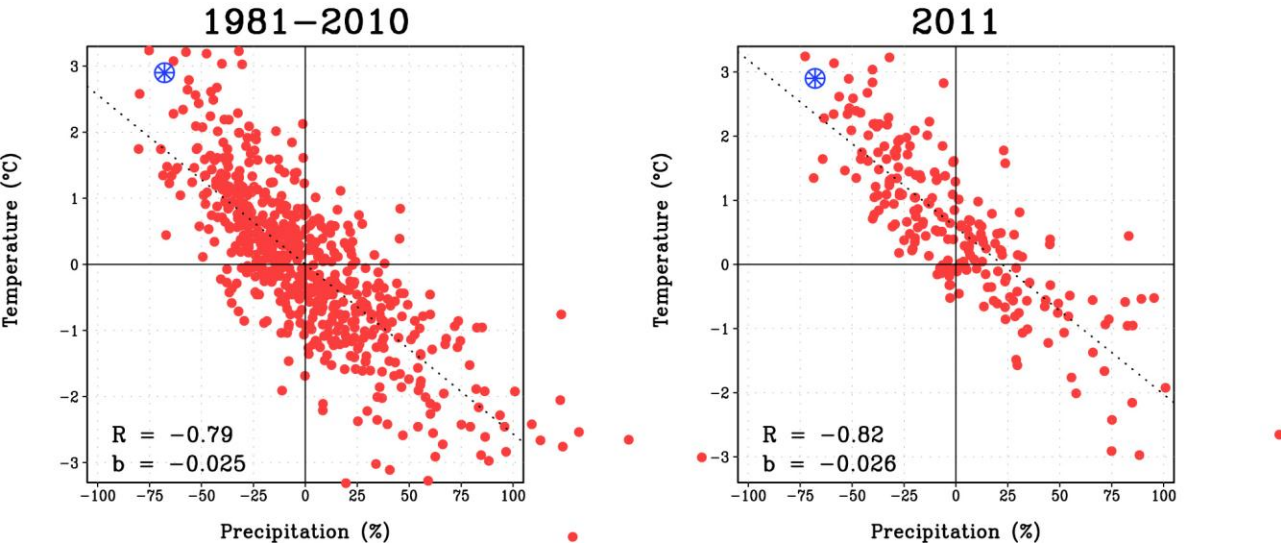
AMIP

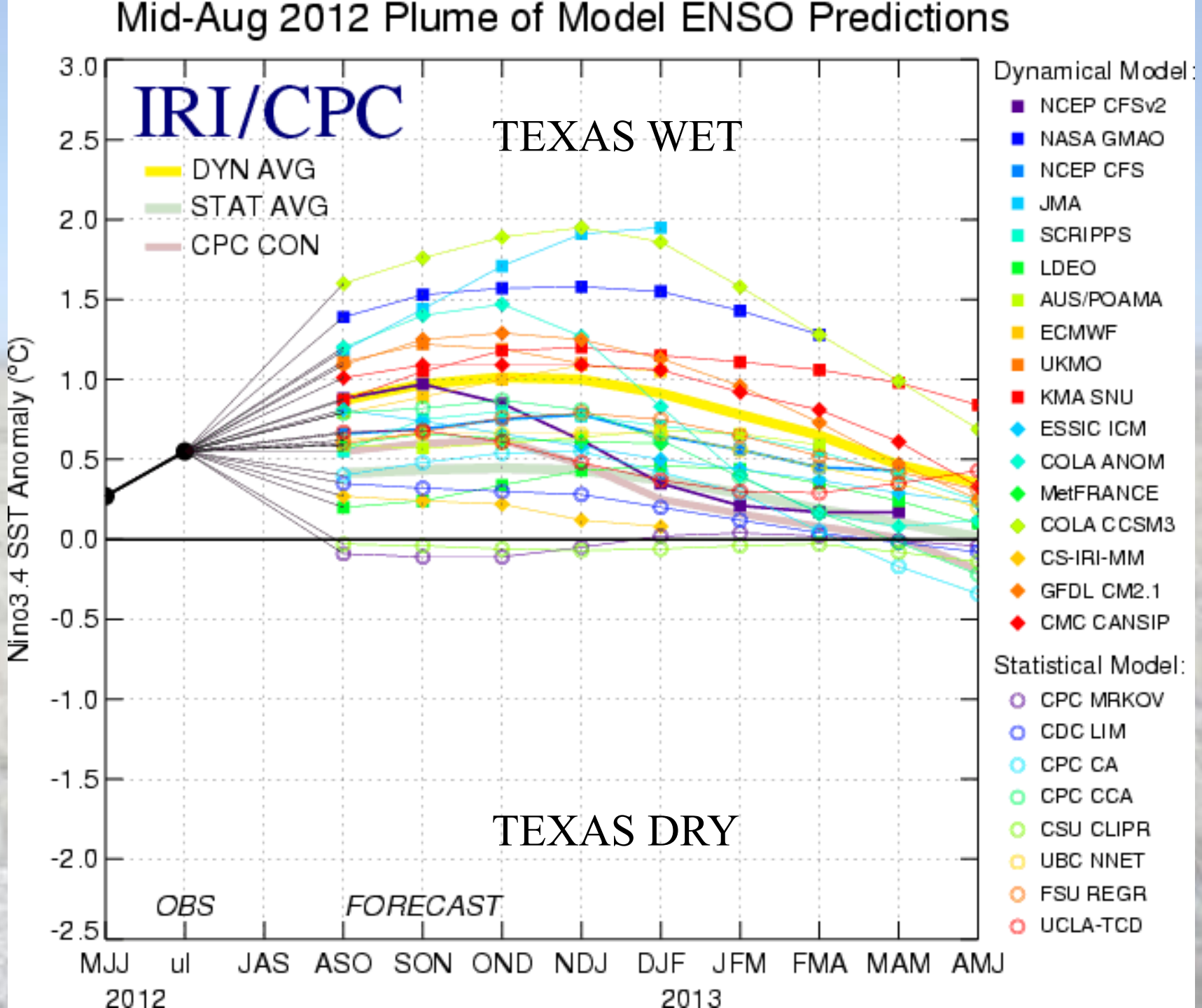
Summer Tmp vs. Summer Pcpn



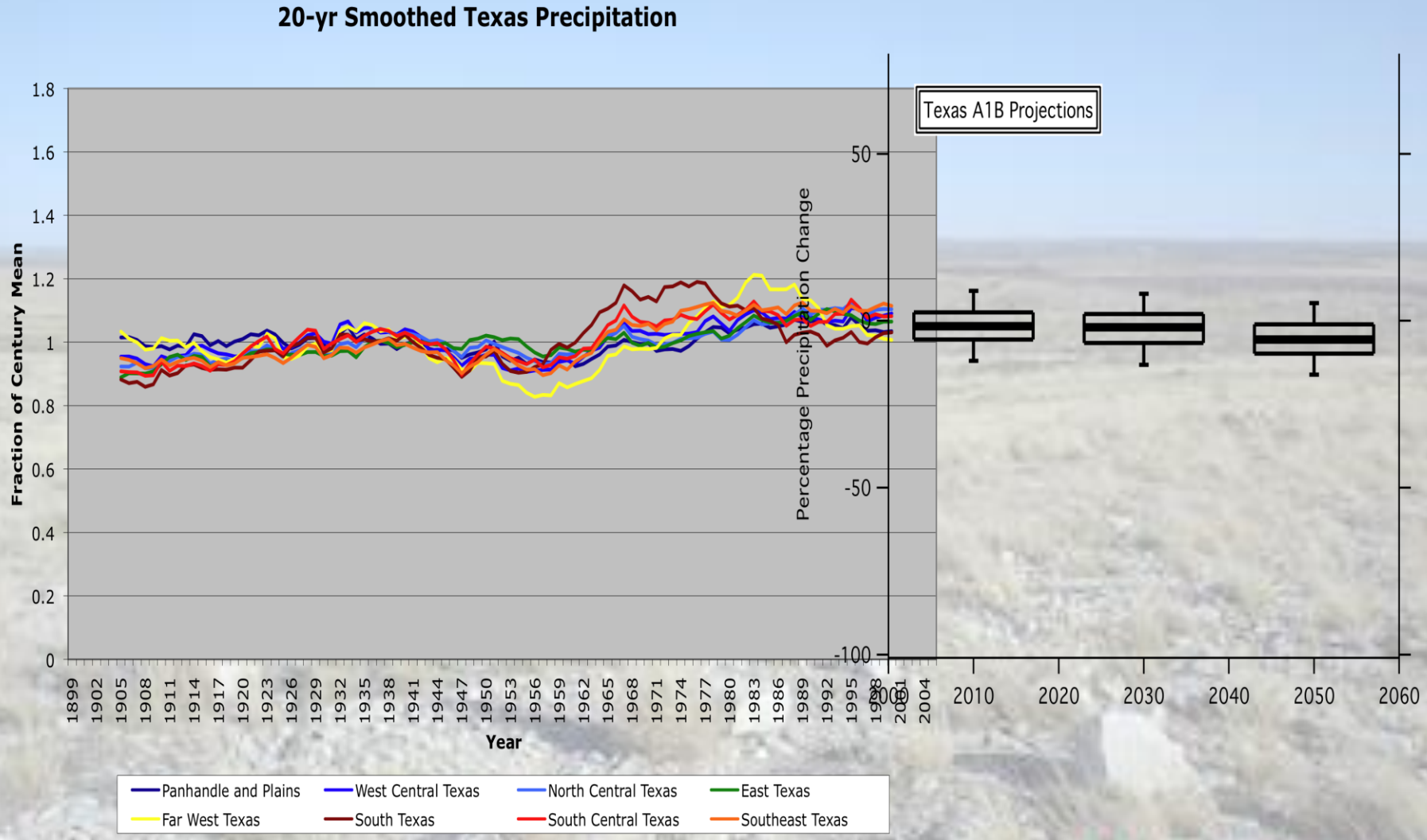
CMIP5

Summer Tmp vs. Summer Pcpn




Mid-Aug 2012 Plume of Model ENSO Predictions
IRI/CPC
TEXAS WET
TEXAS DRY
DYN AVG
STAT AVG
CPC CON
Nino3.4 SST Anomaly (°C)
3.0
2.5
2.0
1.5
1.0
0.5
0.0
-0.5
-1.0
-1.5
-2.0
-2.5
OBS
FORECAST
MJJ
Jul
JAS
ASO
SON
OND
NDJ
DJF
JFM
FMA
MAM
AMJ
2012
2013
Dynamical Model:
NCEP CFSv2
NASA GMAO
NCEP CFS
JMA
SCRIPPS
LDEO
AUS/POAMA
ECMWF
UKMO
KMA SNU
ESSIC ICM
COLA ANOM
MetFRANCE
COLA CCSM3
CS-IRI-MM
GFDL CM2.1
CMC CANSIP
Statistical Model:
CPC MRKOV
CDC LIM
CPC CA
CPC CCA
CSU CLIPR
UBC NNET
FSU REGR
UCLA-TCD

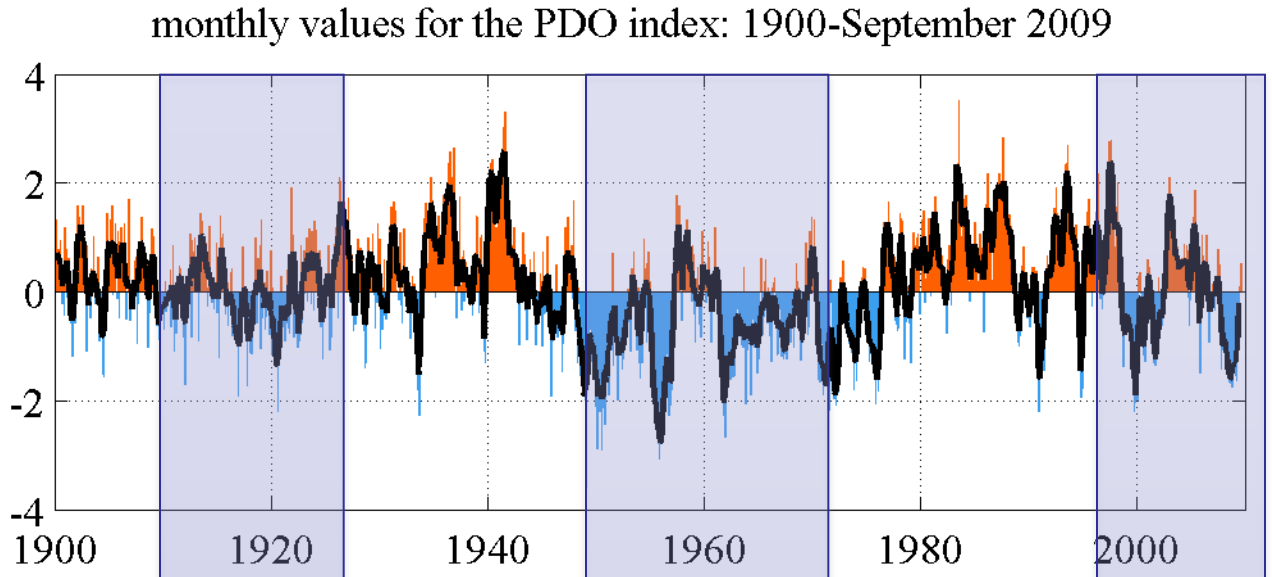
Texas Precipitation: History and Projections

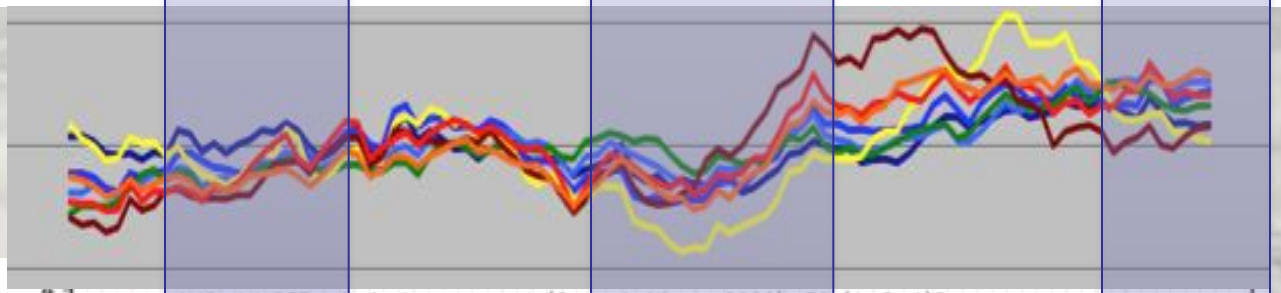


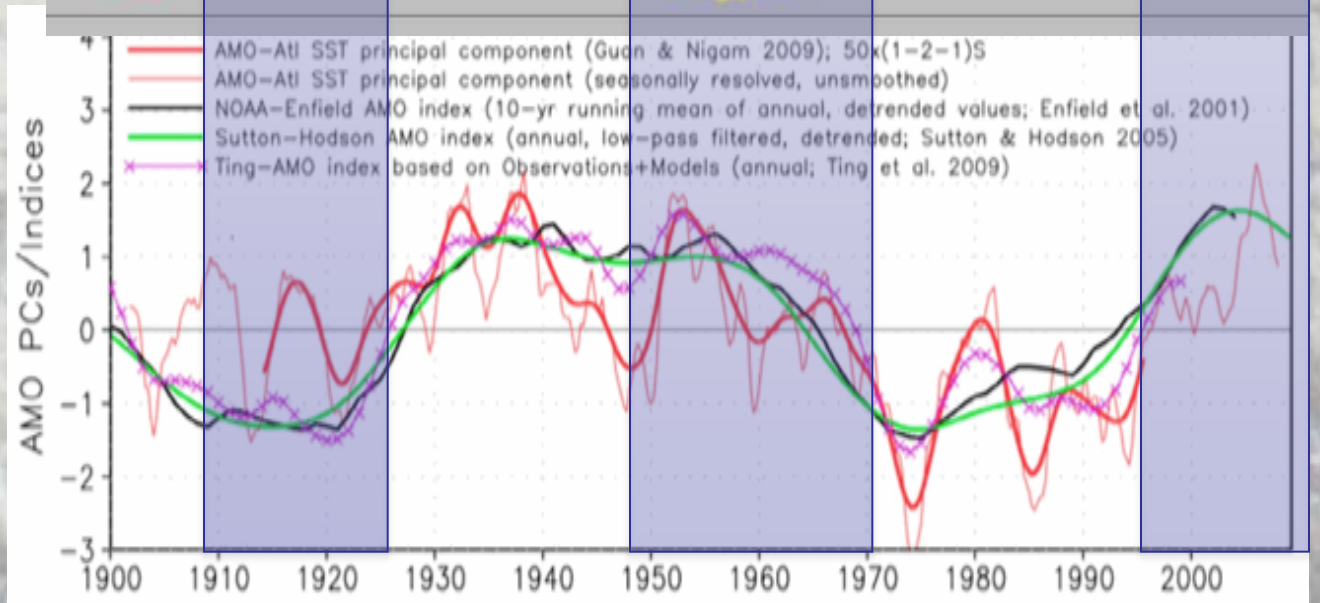
Pacific

Texas

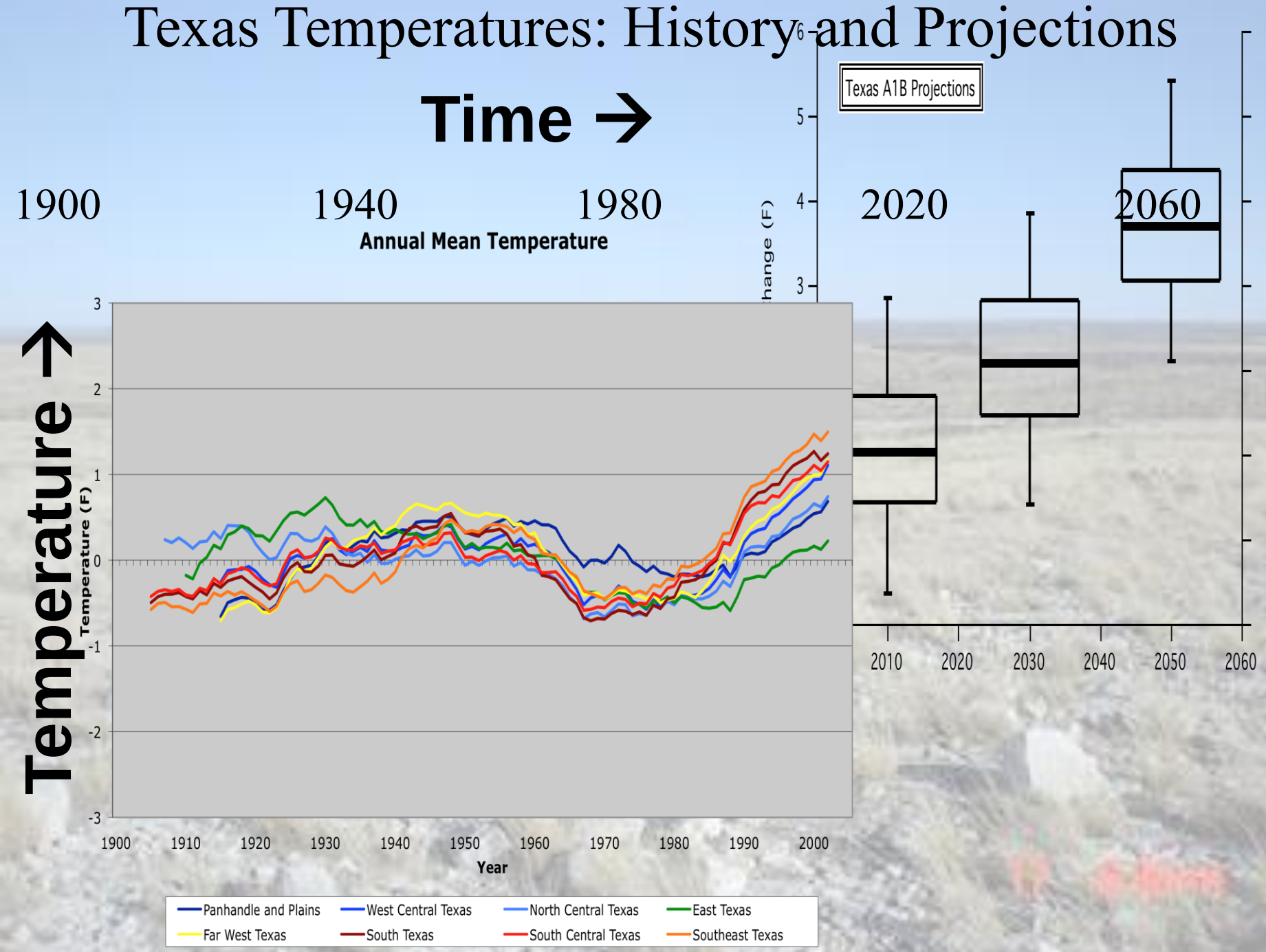
Atlantic







Texas Temperatures: History and Projections



Drought Outlook

- Switch to El Niño
  - Drought likely to shrink considerably this winter
  - Time to cross fingers
- Long-term patterns in Pacific and Atlantic still favor drought

Drought and Climate Change

- Precipitation changes: unknown
- El Niño changes: unknown
- Temperatures will become warmer
  - More evaporation, more water demand, less streamflow
  - The same amount of water won't go as far as it used to, and won't cool as effectively

Other Extreme Climate

- Tornadoes, Hail: unknown
- Hurricanes: Fewer, some stronger?
- Sea level: Subsidence + sea level rise
- Floods: More intense heavy rain, but…
- Sun, Wind: Relatively small changes

Contact Information

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